IN THE CLAIMS:

The following is a complete listing of the claims and replaces all earlier listings and all earlier versions.

1. -18. (Canceled).

19.   (Previously Presented) An image processing apparatus that changes a dynamic range of an original image, comprising:

a gradation conversion unit adapted to perform a gradation conversion on the original image, based on a gradation conversion curve;

a high-frequency-component generation unit adapted to generate a high-frequency component of the original image or an image obtained from the gradation conversion performed on the original image by said gradation conversion unit;

a conversion unit adapted to convert a magnitude of an amplitude of the high-frequency component; and

a control unit adapted to control an addition of the high-frequency component converted by said conversion unit, after performance of the gradation conversion on the original image by said gradation conversion unit,

wherein said conversion unit converts the magnitude of the amplitude of the high-frequency component, based on information concerning an inclination of the gradation conversion curve.

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2   20.   (Previously Presented) An apparatus according to Claim 19, wherein said conversion unit converts the magnitude of the amplitude of the high-frequency component, based on the information concerning the inclination of the gradation conversion curve and a pixel value obtained based on the original image.

3   21.   (Previously Presented) An apparatus according to Claim 19, wherein said conversion unit converts the magnitude of the amplitude of the high-frequency component, based on a differential value of the gradation conversion curve.

4   22.   (Previously Presented) An apparatus according to Claim 19, further comprising an input unit adapted to input a variable for changing a form of the gradation conversion curve.

5   23.   (Previously Presented) An apparatus according to Claim 19, wherein said high-frequency-component generation unit generates a smoothened image of the original image, and generates the high-frequency component by subtracting the smoothened image from the original image.

6   24.   (Previously Presented) An apparatus according to Claim 19, wherein said high-frequency-component generation unit generates a smoothened image of the original image after the gradation conversion, and generates the high-frequency component by subtracting the smoothened image from the original image after the gradation conversion.

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25.　　(Previously Presented) An apparatus according to Claim 24, wherein the smoothened image is formed by using a morphological filter.

26.　　(Previously Presented) An apparatus according to Claim 19, wherein said gradation conversion unit converts a form of the gradation conversion curve, based on a feature amount calculated based on the original image.

27.　　(Previously Presented) An image processing apparatus comprising:

a smoothening unit adapted to obtain a smoothened image from an original image;

a high-frequency-component generation unit adapted to generate, as a high-frequency component, a difference between the smoothened image obtained by said smoothening unit and the original image;

a gradation conversion unit adapted to convert a gradation of the original image by using a gradation conversion curve;

a second smoothening unit adapted to obtain a second smoothened image from an image obtained from the gradation conversion performed by said gradation conversion unit; and

a high-frequency-component addition unit adapted to add the high-frequency component to the second smoothened image.

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28.   (Previously Presented) An apparatus according to Claim 27, wherein said high-frequency-component addition unit changes an amplitude of the high-frequency component, based on a pixel value obtained based on the original image, and adds the high-frequency component whose amplitude has been changed to the second smoothened image.

29. and 30.   (Canceled).

31.   (Previously Presented) An image processing apparatus comprising:

a smoothening unit adapted to obtain a smoothened image from an original image;

a high-frequency-component generation unit adapted to generate, as a high-frequency component, a difference between the smoothened image obtained by said smoothening unit and the original image;

a gradation conversion unit adapted to convert a gradation of the original image by using a gradation conversion curve;

a conversion unit adapted to convert a magnitude of an amplitude of the high-frequency component, based on a value concerning an inclination of the gradation conversion curve; and

a high-frequency-component addition unit adapted to add the high-frequency component whose magnitude of the amplitude has been changed by said conversion unit to the image whose gradation has been converted.

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32. (Previously Presented) An apparatus according to Claim 31, wherein said conversion unit converts the magnitude of the amplitude of the high-frequency component, based on information concerning the inclination of the gradation conversion curve and a pixel value obtained based on the original image.

33. (Previously Presented) An image processing apparatus comprising:

a gradation conversion unit adapted to obtain a converted image by converting a gradation of an original image;

a smoothening unit adapted to obtain a smoothened image by smoothing the converted image;

a high-frequency-component generation unit adapted to obtain, as a high-frequency component, a difference between the smoothened image and the converted image;

a conversion unit adapted to convert a magnitude of an amplitude of the high-frequency component, based on a value concerning an inclination of a gradation conversion curve; and

a high-frequency-component addition unit adapted to add the high-frequency component whose magnitude of the amplitude has been converted by said conversion unit to the converted image.

34. (Previously Presented) An apparatus according to Claim 33, wherein said conversion unit converts the magnitude of the amplitude of the high-frequency

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component, based on information concerning the inclination of the gradation conversion curve
and a pixel value obtained based on the original image.

[35. and 36.   (Canceled).

37.   (Currently Amended) An image processing method comprising:

a high-frequency-component conversion step[[,]] of converting an amplitude
of a high-frequency component of an image, based on information concerning an inclination
of a gradation conversion curve; and

an addition step[[,]] of adding the high-frequency component, converted in said
high-frequency-component conversion step, to an arbitrary image.

38.   (Previously Presented) An apparatus according to Claim 23, wherein
the smoothened image is formed by using a morphological filter.

39.   (Currently Amended) An image processing method for changing a
dynamic range of an original image, comprising:

a gradation conversion step[[,]] of performing a gradation conversion on the
original image, based on a gradation conversion curve;

a high-frequency-component generation step[[,]] of generating a high-frequency
component of the original image or an image obtained from the gradation conversion
performed on the original image in said gradation conversion step;

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a conversion step[[,]] of converting a magnitude of an amplitude of the high-frequency component; and

a control step[[,]] of controlling an addition of the high-frequency component converted in said conversion step, after performance of the gradation conversion on the original image in said gradation conversion step,

wherein said conversion step includes converting the amplitude of the high-frequency component, based on information concerning an inclination of the gradation conversion curve.

40.¹⁹ (Currently Amended) An image processing method comprising:

a smoothening step[[,]] of obtaining a smoothened image from an original image;

a high-frequency-component generation step[[,]] of generating, as a high-frequency component, a difference between the smoothened image obtained in said smoothening step and the original image;

a gradation conversion step[[,]] of converting a gradation of the original image by using a gradation conversion curve;

a second smoothening step[[,]] of obtaining a second smoothened image from an image obtained from the gradation conversion performed in said gradation conversion step; and

a high-frequency-component addition step[[,]] of adding the high-frequency component to the second smoothened image.

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41.   (Canceled).

42.²⁰   (Currently Amended) An image processing method comprising:

a smoothening step[[,]] of obtaining a smoothened image from an original image;

a high-frequency component generation step[[,]] of generating, as a high-frequency component, a difference between the smoothened image obtained in said smoothening step and the original image;

a gradation conversion step[[,]] of converting a gradation of the original image by using a gradation conversion curve;

a conversion step[[,]] of converting a magnitude of an amplitude of the high-frequency component, based on a value concerning an inclination of the gradation conversion curve; and

a high-frequency component addition step[[,]] of adding the high-frequency component whose magnitude of the amplitude has been changed in said conversion step to the image whose gradation has been converted.

43.²¹   (Currently Amended) An image processing method comprising:

a gradation conversion step[[,]] of obtaining a converted image by converting a gradation of an original image;

a smoothening step[[,]] of obtaining a smoothened image by smoothing the converted image;

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a high-frequency-component generation step[[,]] of obtaining, as a high-frequency component, a difference between the smoothened image and the converted image;

a conversion step[[,]] of converting a magnitude of an amplitude of the high-frequency component, based on a value concerning an inclination of a gradation conversion curve; and

a high-frequency-component addition step[[,]] of adding the high-frequency component whose magnitude of the amplitude has been converted in said conversion step to the converted image.

44. 22. (Currently Amended) A program product embodying a program for executing an image processing method for changing a dynamic range of an original image, the method comprising:

a gradation conversion step[[,]] of performing a gradation conversion on the original image, based on a gradation conversion curve;

a high-frequency-component generation step[[,]] of generating a high-frequency component of the original image or an image obtained from the gradation conversion performed on the original image in said gradation conversion step;

a conversion step[[,]] of converting a magnitude of an amplitude of the high-frequency component; and

a control step[[,]] of controlling an addition of the high-frequency component converted in said conversion step, after performance of the gradation conversion on the original image in said gradation conversion step,

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wherein said conversion step includes converting the magnitude of the amplitude of the high-frequency component, based on information concerning an inclination of the gradation conversion curve.

46. 23 (Currently Amended) A program product embodying a program for executing an image processing method, the method comprising:

a smoothening step[[,]] of obtaining a smoothened image from an original image;

a high-frequency-component generation step[[,]] of generating, as a high-frequency component, a difference between the smoothened image obtained in said smoothening step and the original image;

a gradation conversion step[[,]] of converting a gradation of the original image by using a gradation conversion curve;

a second smoothening step[[,]] of obtaining a second smoothened image from an image obtained from the gradation conversion performed in said gradation conversion step; and

a high-frequency-component addition step[[,]] of adding the high-frequency component to the second smoothened image.

46.   (Canceled).

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47. 24 (Currently Amended) A program product embodying a program for executing an image processing method, the method comprising:

a smoothening step[[,]] of obtaining a smoothened image from an original image;

a high-frequency-component generation step[[,]] of generating, as a high-frequency component, a difference between the smoothened image obtained in said smoothening step and the original image;

a gradation conversion step[[,]] of converting a gradation of the original image by using a gradation conversion curve;

a conversion step[[,]] of converting a magnitude of an amplitude of the high-frequency component, based on a value concerning an inclination of the gradation conversion curve; and

a high-frequency-component addition step[[,]] of adding the high-frequency component whose magnitude of the amplitude has bean changed in said conversion step to the image whose gradation has been converted.

48. 25 (Currently Amended) A program product embodying a program for executing an image processing method, the method comprising:

a gradation conversion step[[,]] of obtaining a converted image by converting a gradation of an original image;

a smoothening step[[,]] of obtaining a smoothened image by smoothing the converted image;

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a high-frequency-component generation step[[,]] of obtaining, as a high-frequency component, a difference between the smoothened image and the converted image;

a conversion step[[,]] of converting a magnitude of an amplitude of the high-frequency component, based on a value concerning an inclination of a gradation conversion curve; and

a high-frequency-component addition step[[,]] of adding the high-frequency component whose magnitude of the amplitude has been converted in said conversion step to the converted image.

49.   (Currently Amended) A storage medium storing a program for executing an image processing method for changing a dynamic range of an original image, the method comprising:

a gradation conversion step[[,]] of performing a gradation conversion on the image, based on a gradation conversion curve;

a high-frequency-component generation step[[,]] of generating a high-frequency component of the original image or an image obtained from the gradation conversion performed on the original image in said gradation conversion step;

a conversion step[[,]] of converting a magnitude of an amplitude of the high-frequency component; and

a control step[[,]] of controlling an addition of the high-frequency component converted in said conversion step, after performance of the gradation conversion on the original image in said gradation conversion step,

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wherein said conversion step includes converting the magnitude of the amplitude of the high-frequency component, based on information concerning an inclination of the gradation conversion curve.

50. (Currently Amended) A storage medium storing a program for executing an image processing method, the method comprising:

a smoothening step[[,]] of obtaining a smoothened image from an original image;

a high-frequency-component generation step[[,]] of generating, as a high-frequency component, a difference between the smoothened image obtained in said smoothening step and the original image;

a gradation conversion step[[,]] of converting a gradation of the original image by using a gradation conversion curve;

a second smoothening step[[,]] of obtaining a second smoothened image from an image obtained from the gradation conversion performed in said gradation conversion step; and

a high-frequency-component addition step[[,]] of adding the high-frequency component to the second smoothened image.

51.   (Canceled).

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52.   (Currently Amended) A storage medium storing a program for executing an image processing method, the method comprising:

a smoothening step[[,]] of obtaining a smoothened image from an original image;

a high-frequency-component generation step[[,]] of generating, as a high-frequency component, a difference between the smoothened image obtained in said smoothening step and the original image;

a gradation conversion step[[,]] of converting a gradation of the original image by using a gradation conversion curve;

a conversion step[[,]] of converting a magnitude of an amplitude of the high-frequency component, based on a value concerning an inclination of the gradation conversion curve; and

a high-frequency-component addition step[[,]] of adding the high-frequency component whose magnitude of the amplitude has been changed in said conversion step to the image whose gradation has been converted.

53.   (Currently Amended) A storage medium storing a program for executing an image processing method, the method comprising:

a gradation conversion step[[,]] of obtaining a converted image by converting a gradation of an original image;

a smoothening step[[,]] of obtaining a smoothened image by smoothing the converted image;

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a high-frequency-component generation step[[,]] of obtaining, as a high-frequency component, a difference between the smoothened image and the converted image;

a conversion step[[,]] of converting a magnitude of an amplitude of the high-frequency component, based on a value concerning an inclination of a gradation conversion curve; and

a high-frequency-component addition step[[,]] of adding the high-frequency component whose magnitude of the amplitude has been converted in said conversion step to the converted image.

54. (Previously Presented) An apparatus according to Claim 49, further comprising:

radiation generation means for irradiating radiation rays onto an object; and

a two-dimensional X-ray sensor for converting radiation rays transmitted through the object into an image,

wherein the image obtained by said two-dimensional X-ray sensor serves as the original image.

55. (Currently Amended) An image processing apparatus comprising:

storage means for storing information concerning a gradation conversion curve;

high-frequency component generation means for generating a high-frequency component of an image, or of an image obtained by performing gradation conversion on the image[[,]] using the gradation conversion curve;

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conversion means for converting a magnitude of an amplitude of the high-frequency component; and

addition means for adding the converted high-frequency component to the image, or to the image obtained by performing the gradation conversion on the image using the gradation conversion curve,

wherein said conversion means converts the amplitude of the high-frequency component on the basis of the information concerning the gradation conversion curve.

56. (Previously Presented) An apparatus according to Claim 55, wherein said conversion means converts the magnitude of the amplitude of the high-frequency component on the basis of the information concerning an inclination of the gradation conversion curve.

57. (Previously Presented) An apparatus according to Claim 55, wherein said conversion means converts the magnitude of the amplitude of the high-frequency component on the basis of a differential value of the gradation conversion curve.

58. (Previously Presented) An apparatus according to Claim 55, further comprising input means for inputting a variable for changing a curve form of the gradation conversion curve.

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59. (Previously Presented) An apparatus according to Claim 55, wherein said high-frequency component generation means generates a smoothed image from the image and subtracts the smoothed image from the image, thereby to generate the high-frequency component.

60. (Previously Presented) An apparatus according to Claim 59, wherein the smoothed image is formed by using a morphological filter.

61. (Previously Presented) An apparatus according to Claim 55, wherein said high-frequency component generation means generates a smoothed image from the image after the gradation conversion, and subtracts the smoothed image from the image after the gradation conversion, thereby to generate the high-frequency component.

62. (Previously Presented) An apparatus according to Claim 61, wherein the smoothed image is formed by using a morphological filter.

63. (Previously Presented) An apparatus according to Claim 55, wherein a curve form of the gradation conversion curve is changed according to a feature amount calculated based on the image.

64. (Previously Presented) An apparatus according to Claim 55, further comprising:

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radiation generation means for irradiating radiation rays onto an object, and

a two-dimensional X-ray sensor for converting the radiation ray transmitted through the object into an image,

wherein the image obtained by said two-dimensional X-ray sensor serves as the original image.

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6̶5̶. (Currently Amended) An image processing method comprising:

a storage step[[,]] of storing information concerning a gradation conversion curve;

a high-frequency component generation step[[,]] of generating a high-frequency component of an image or an image obtained by performing gradation conversion on the image[[,]] using the gradation conversion curve;

a conversion step[[,]] of converting a magnitude of an amplitude of the high-frequency component; and

an addition step[[,]] of adding the converted high-frequency component to the image, or to the image obtained by performing the gradation conversion on the image using the gradation conversion curve,

wherein said conversion step includes converting the amplitude of the high-frequency component on the basis of the information concerning the gradation conversion curve.

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66.   (Currently Amended) A program for executing an image processing method comprising:

a storage step[[,]] of storing information concerning a gradation conversion curve;

a high-frequency component generation step[[,]] of generating a high-frequency component of an image or an image obtained by performing gradation conversion on the image using the gradation conversion curve;

a conversion step[[,]] of converting a magnitude of an amplitude of the high-frequency component; and

an addition step[[,]] of adding the converted high-frequency component to the image, or to the image obtained by performing the gradation conversion on the image using the gradation conversion curve,

wherein said conversion step includes converting the amplitude of the high-frequency component on the basis of the information concerning the gradation conversion curve.

67.   (Currently Amended) A storage medium which stores a program for executing an image processing method, said method comprising:

a storage step[[,]] of storing information concerning a gradation conversion curve;

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a high-frequency component generation step[[,]] of generating a high-frequency component of an image, or of an image obtained by performing gradation conversion on the image using the gradation conversion curve;

a conversion step[[,]] of converting a magnitude of an amplitude of the high-frequency component; and

an addition step[[,]] of adding the converted high-frequency component to the image, or to the image obtained by performing the gradation conversion on the image using the gradation conversion curve,

wherein said conversion step includes converting the amplitude of the high-frequency component on the basis of the information concerning the gradation conversion curve.

68.   (Canceled).

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